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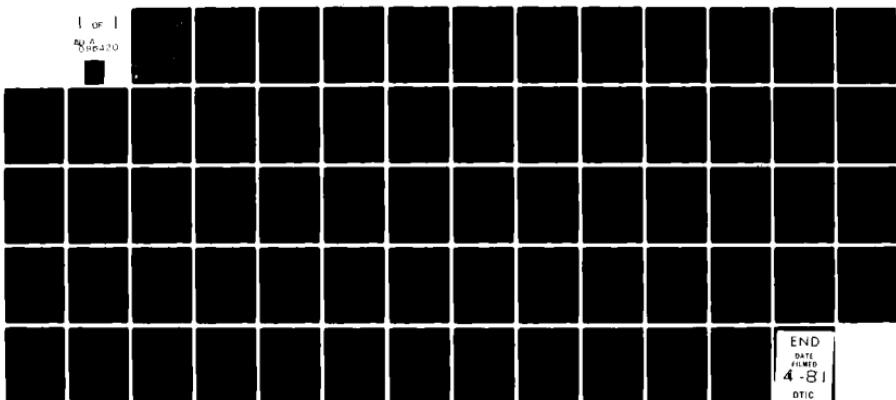
OFFICE OF THE CHIEF OF ENGINEERS (ARMY) WASHINGTON DC  
AQUATIC PLANT CONTROL PROGRAM, NEW YORK STATE, (U)  
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18. KEY WORDS (Continue on reverse side if necessary and identify by block number) Aquatic Plant Control 2,4-D Water Chestnut	20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Waterchestnut ( <u>Trapa natans</u> ) is an annual plant, thereby relying on the production of the seeds for existence. Each germinated seed is capable of producing 10 to 15 rosettes of leaves crowded together on the end of the stem which float on the surface much the same as Waterlily leaves. In some cases, these become so dense that they stand upright out of the water. Each rosette produces 15 to 20 seeds, which when mature are about the size of a hickory nut and have four sharp recurved spines. These are slightly buoyant and are transported by tides and currents. They remain viable for several years. The	

germinating seed sends out a stolon which gives rise to several tough stems, each of which may branch several times and be as long as 15 feet. Thus, the rosettes from a single plant may form a surface cover of up to 10 feet in diameter.

In a review of current research, the Scientific Advisory Panel (FIFRA) did not recommend further research studies to determine the No Effect Level and it is presumed that 2,4-D as used in the Aquatic Plant Control Program, State of New York, does not create environmental or health hazards.

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AQUATIC PLANT CONTROL PROGRAM,

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INTRODUCTION

Waterchestnut (Trapa natans) is an annual plant, thereby relying on the production of the seeds for existence. Each germinated seed is capable of producing 10 to 15 rosettes of leaves crowded together on the end of the stem which float on the surface much the same as Waterlily leaves. In some cases, these become so dense that they stand upright out of the water. Each rosette produces 15 to 20 seeds, which when mature are about the size of a hickory nut and have 4 sharp recurved spines. These are slightly buoyant and are transported by tides and currents. They remain viable for several years. The germinating seed sends out a stolon which gives rise to several tough stems, each of which may branch several times and be as long as 15 feet. Thus the rosettes from a single plant may form a surface cover of up to 10 feet in diameter. This is a freshwater plant and will not tolerate any salinity. Therefore, distribution is limited. Probably the recent changes in the salinity-fresh water zones resulting from drought conditions in the Middle Atlantic States has had some affect on the plant.

Waterchestnut was introduced into New York about 1880. Since that time, it has become a serious weed problem in New York, Massachusetts, Vermont, Maryland, and Virginia.

1/Abstracted and updated from the Design Memorandum and Environmental Impact Statement, prepared by the U.S. Army Corps of Engineers, New York District, New York, final statement filed with CEQ 27 January 1972.

During the past several years, various agencies in Maryland have made serious attempts to control this plant. These efforts have been made primarily with a mechanical harvester mounted on a barge. This equipment is relatively difficult to operate and its efficiency is poor. It does not have the desired working maneuverability and is subject to continual corrosion of its underwater working parts. Even with good mechanical operation, harvesting is limited to about 3 acres per day. In order to maintain an area free from re-infestation, it has been estimated that 3/4 of the area must be treated annually and this may involve two or three cuttings each season. The procedure is expensive and the chance for regrowth from uncollected rosettes is great.

#### HUDSON RIVER VALLEY

a. Sport fishing. It is estimated that control of water chestnut in the Hudson River Basin would open up 2500 acres of new waters for sport fishing. Following the principles established in H.D. 251, 89th Congress, use of 6 fisherman days per acre per fishing season has been conservatively estimated for this area, and using a benefit of \$1.50 per fisherman day gives a benefit of \$22,500 for weed control as related to sport fishing.

b. Hunting. Of the 2500 acres of open water created, one acre in four has some hunting value. Areas suitable for waterfowl hunting are leased for \$8 to \$12 per acre per year, according to information released by Fish and Wildlife Service. Based on a value of \$8 per acre, 625 acres have an estimated annual value of \$5,000.

c. Recreation. Recreation benefits considered included those for boating, swimming, water skiing, picnicking, camping and sightseeing. The areas clogged with water chestnut inhibit the use of these areas for water contact and related recreation activities. Using general recreation as a basis for estimating benefits, it is conservatively estimated, based on projections made in the State Outdoor Recreation Plan that population in this area will grow by 25% and that swimming demand will increase by 50% and boating by more than 25%, that control of water chestnut will add 100,000 user days of recreation opportunities. At \$1.00 per user day, this would provide a yearly benefit of \$100,000.

d. Public Health. Waterchestnut in the Basin is of particular concern from the standpoint of mosquito and black fly control. Estimating the value of control benefits to be derived from the control of waterchestnut, it was estimated that 1000 acres needed to be treated annually at a cost of \$10.00 per acre per year, based on 10 treatments a season at \$1.00 each. The value of this control then is \$10,000.

The total benefits to accrue to the Aquatic Plant Control Program in the Hudson River Basin are summarized below according to general and local benefits:

BENEFIT	TOTAL	GENERAL	LOCAL
Sport Fishing	22,500	11,250	11,250
Hunting	5,000	2,500	2,500
Recreation	100,000	50,000	50,000
Public Health	<u>10,000</u>	<u>5,000</u>	<u>5,000</u>
TOTAL	137,500	68,750	68,750

## ENVIRONMENTAL IMPACT STATEMENT

1. Project Description: The authorized project provides for work leading to the control and progressive eradication of waterchestnut in and from the waters within Hudson and Mohawk Rivers. Waterchestnut control is presently the only Federally justified and authorized aquatic plant control work in New York State. Waterchestnut, (Trapa natans) an annual aquatic plant are usually found in polluted waters and therefore may be contaminated so they should not be eaten. Each new season's growth is produced entirely from the seeds of this annual plant. In New York the seeds germinate every spring at the beginning of May, and form a cordlike stem 6 inches to 15 feet long which reaches the surface about the middle of June or somewhat later in deeper water. The plant has no primary root, but is weakly anchored in the bottom muds by lateral roots. A dense rosette of leaves. Each rosette provides 10 to 15 nuts each with sharp barbs. The nuts being heavier than water sink to the bottom when they become ripe and drop off the plant. They are viable for at least two years.

The method employed to eradicate the plant is to treat the larger dense stands chemically and the small infestations by a hand-pulled operation. As the larger areas are reduced to scattered plants which are impractical to spray, they too are hand-pulled. Spraying is both by hand and by boat. The chemical formulation found to give the best results is 2,4 dichlorophenoxyacetic acid (2,4-D) at four pounds acid equivalent applied at a minimum rate of 1-2 gallons/acre. No spraying is to take place in the immediate vicinity of water supply intakes nor for a distance of 1000 feet upstream of the intake.

2. Environmental Setting Without the Project.

a. General. The Hudson River, the principle river of New York State originates in the Adirondack Mountains and flows south for approximately 300 miles to New York Bay. The portion from New York Bay to Albany, is a 150 mile tidal estuary. This part of the river is banked on both sides by steep slopes and cliffs formed by the higher rolling hills of the relatively narrow basin. Above Albany, the basin widens and separates into two main branches, the Hudson River continuing to the north and the Mohawk River entering from the west. Together these two Rivers drain more than 13,000 square miles. Various canals join this system with Lake Champlain and Lake Erie. Velocities in the system vary from extremely fast water to slow and sluggish.

b. Recreation. Recreation facilities of all types are located all along the Hudson and Mohawk Rivers. Included are many campsites, lakes and streams with swimming, boat launching and fishing facilities, hiking trails and scenic areas. Boating is a recreational activity hampered by the existence of the waterchestnut. Of the approximately 65 marine facilities located in the study area, about 27 are directly adversely affected by the plant. These facilities account for about 1000 boats. Swimming and water-skiing and to a lesser degree picnicking, camping and sightseeing are other recreational activities which are hampered where the water area is clogged with waterchestnut. In several instances, the plant has hindered the velocity of flow in intake systems. It is also of particular concern from the standpoint of mosquito and blackfly control.

c. Fish and Wildlife. Control of waterchestnut in the Hudson and Mohawk Rivers would open up about 1000 additional acres of new water for sport fishing and about 350 acres which have some hunting value, primarily for waterfowl. Waterfowl are abundant and bear are often encountered. Fur bearing animals, such as muskrat, skunk, beaver, racoon, otter and mink are also found. The lakes and streams of the basin abound in trout, small-mouth bass, large-mouth bass, whitefish, sunfish, yellow perch, bullhead, pickerel, rockbass, crappier, suckers, minnows, bluegill and eels. Unchecked waterchestnut infestations would have a negative effect on these fish resources.

d. Pollution. Drainage from agricultural lands and discharge of sewage and industrial wastes into the Mohawk River, although often increasing fertility has brought about a deterioration in water quality. While increased fertility makes the waters more productive biologically much of the productivity is not high value food or game fish. The Mohawk River contains large amounts of underutilized fish, including carp and goldfish. There has also been a deterioration in water quality in the Lower Hudson River Basin. This has affected the shad, striped bass and sturgeon.

3. The Environmental Impacts Of The Proposed Action. Boating, a recreational activity hampered by the existence of waterchestnut, would no longer suffer due to the weed. Marinas which could not operate, would be reopened as would water related recreation areas situated adjacent to the infestations, adding to the economic benefits accruing from such forms of recreation. Adequate velocities would be maintained for intake systems, assuring a supply of potable water. Mosquito and blackfly

problems would be controlled, eliminating a possible health problem.

Fish production would no longer suffer, and species composition would be maintained. New areas for sport fishing and hunting would be made available to the outdoorsman.

4. Any Adverse Environmental Effects Which Cannot Be Avoided Should The Proposal Be Implemented. As the dying waterchestnut plants start to deteriorate there is a nutrient release into the water, and tremendous duckweed (Lemna minor L.) blooms form. The remains of the waterchestnut plants hold the duckweed in the bays. As the chestnut drops, the duckweed is released from the chestnut plot and is taken by the tide and other currents. Usually the tide pulls the duckweed out of the bays and through the railroad bridges into the open river. The wind and tide create long green streaks that are quite noticeable. Eventually some of the duckweed is blown up on the shore where it decomposes. The remaining plants sink with the onset of cooler weather.

A problem arises from this situation when a marina in a tributary is infested with the duckweed when the prevailing current directs it into the backwater. Breakwaters or floating docks may prevent the duckweed from floating freely out into the open river, and the trapped duckweed builds up on the surface of the water turning it all green. Duckweed also clogs the cooling systems of outboard motors.

2,4-D has a temporary effect on non target aquatic plants, such as spatterdock, accelerating its growth in grotesque form. It has not killed anything except in rare instances where drift occurs. Since there is no spraying within 1000 feet of intakes upstreams, spray levels are low, dilution high, and the tidal factor such that entire bays are flushed

frequently, there are no deleterious effects on the rivers as a source of water supply.

5. Alternatives To The Proposed Action. The only successful alternative for the use of boat or hand sprayed 2,4-D at this time is pulling the weeds by hand and removing them from the water. This method is not efficient for anything other than reasonably small plots. Other alternatives which were employed but which were found to be unsuccessful were mowing with large cutters and fixed wing and helicopter air spraying of a 2,4-D ester and fuel oil formulation. Cutting proved costly and inefficient, and air spraying had drift problems. By simply doing nothing the problem would become increasingly more difficult to control in subsequent years. It would constitute a source of infestation thereby threatening other state waters.

6. The Relationship Between Local Short Term Uses Of Man's Environment And The Maintenance And Enhancement Of Long Term Productivity. It appears that certain biological manifestations of a positive nature might result from the control program. In some areas striped bass and white perch were caught in water that had been covered by a dense mat of waterchestnut only three weeks before. Moderate to dense stands of eel grass were found as the waterchestnut dropped. Large areas of rooted aquatics favored by waterfowl have appeared where formerly waterchestnut was the dominant species. There have been no observable negative long term effects on the fish or waterfowl as a consequence of using 2,4-D. It appears that the short term control efforts will contribute much toward the effective long term productivity and overall enhancement of the water resource. There is, however, a need to analyze the results of

the spraying program with respect to the environmental effects of the spray program over a long period of time and this is presently being done. The hand-pulled waterchestnut is not of any significant quantity and is placed along the river banks in small piles where it decomposes. The sprayed weeds drop in place and as noted above in some areas duckweed blooms form. The aim of the project is to change the biota in favor of more desirable waterfowl food plants and there are indications that this will be achieved.

7. Any Irreversible Or Irretrievable Commitment Of Resources Which Would Be Involved If The Proposed Action Should Be Implemented. Other than material and labor costs there does not appear to be any irreversible or irretrievable commitment of resources over a period of time. Indeed, if the control effort is not continued, an irretrievable loss of valuable fish and wildlife resources may result, since the upper Hudson River, and coves and tributaries of the lower Hudson serve as an important source of anadromous fish resources.

COMMENTS OF THE STATE OF NEW YORK

DEPARTMENT OF HEALTH

May 18, 1971

Mr. Everett L. MacLeman  
Environmental Protection Agency  
Region 11 Office  
26 Federal Plaza  
New York, N.Y. 10007

Re: Corps of Engineers  
Environmental Impact Study on  
the Aquatic Vegetation Control Pro-  
gram for the Hudson and Mohawk Rivers

Dear Mr. MacLeman:

We are in receipt of your letter regarding the above project. Indeed, this department is concerned with potential effects of biocides as they may relate to our drinking water supplies in New York State. This department presently reviews all application for pesticide use in coordination with the Department of Environmental Conservation.

Thank you for forwarding a copy of the subject report to this Bureau for review. As you mentioned in your transmittal letter, the report gives no consideration to the possible deleterious effects of the vegetation control program on drinking water-plants using the river water as a source of supply.

This omission is of particular concern to this Department since we feel that the safety of consumers using these water supplies should be of primary concern when a toxic chemical is added to their source of water. It is hoped that any future reports of this type will at least consider the possible effects of drinking water supplies.

I am attaching a copy of a department report prepared by this Bureau regarding a similar application of herbicide to the Mohawk River last year. As you can see from this report, we required certain restrictions to protect the drinking water supplies which were involved. These restrictions amounted to limiting the acreage of water which could be treated at any one time, and not allowing applications of the herbicide within a specified distance of the water system intakes. This was done to assure that water entering the water supply intake would not have a concentration of herbicide greater than 0.1 mg/l and to maintain a minimum lag time of at least 24 hours before any herbicide treated water would reach the consumers.

With regard to the present proposal, we will most likely wish to make comments similar to those above when we receive detailed information on the project. There was no mention in the environmental impact statement as to who had proposed to do the treatment. We assume that it is the New York State Department of Environmental Conservation since they have done this project in the past, and we will be contacting them to get the details of their proposal.

Thank you for bringing this matter to our attention.

Very truly yours,

John C. Bumstead, P.E.  
Director  
Bureau of Public Water Supply

#### METHOD OF APPLICATION

The Environmental Conservation Department has been using "2,4-D" to control waterchestnut infestations in the Mohawk and Hudson Rivers for about ten years. The herbicide "2,-4D" is known to produce more effective control of waterchestnut than other herbicides. On July 8, 1970, the Environmental Conservation Department inquired at the Latham Water District if the district was using its new water supply intake in the Mohawk River and if 2,4-D could be applied to a waterchestnut infestation immediately upstream from the intake. The Latham Water District Superintendent informed the Environmental Conservation Department that the matter should be cleared by the Albany County Health Department. The Water Superintendent immediately notified the Albany County Health Department of the herbicide application proposal. Mr. Thomas Quinn, Director of Environmental Health of Albany Co. H.D., immediately requested the Environmental Conservation Department to not apply 2,4-D above the Cohoes City and Latham Water District water supply intakes until the proposal could be reviewed and found acceptable to eliminate any hazard to the water consumers. Mr. Quinn was informed by Mr. Russell Fieldhouse, of the Environmental Conservation Department, Stamford Regional Office, that the 2,4-D application was scheduled for July 9 or 10, 1970 to be done by a commerical applicator under contract. Mr. George Burdick Environmental Conservation Department, explained the problem and requested cessation of the proposed spraying until the matter was properly resolved (i.e., water customers adequately protected).

The Environmental Conservation Department has routinely been granted an annual blanket permit to apply herbicides and/or pesticides to the waters of New York State by the Health Department with the condition that a report be prepared "of all applications made during the year" and submitted to the Health Department immediately following the end of each year. However, reports received by the Health Department were not forwarded to all parties who might logically be affected by such applications. In essence, these reports have not been forwarded to the Bureau of Public Water Supply (formerly The Bureau of Water & Wastewater Utilities Management), for review to determine possible effects upon water supplies. The reports received included data regarding river basin acreage sprayed, plant controlled, quantity, and name of chemical used and year of application.

To resolve the problem Mr. Olver Hunt of the Basin Development Department was contacted to obtain "average flows" and "time of travel" data for the Mohawk River upstream from the two affected water supply intakes. The average flow for July is 1500 CFS which corresponds with a "time of travel" in the Route 50 to Lock 7 reach of 11.8 hours per mile (average) and the Lock 7 to Crescent Dam reach 16.7 hours per mile (average). The distance from Route 50 to Lock 7 (Vischers Ferry) and from Lock 7 to Crescent Dam is 6.8 miles and 10.2 miles, respectively.

Dr. Henry Wills, Executive Secretary of the Pesticide Control Board, provided. The a definite tolerance level of 2,4-D in water has not been established but a U.S. Public Health Service guideline lists 100 ppb (i.e. 0.1 mg/l) as a maximum acceptable concentration in drinking water. The problem is the production of undesirable tastes and odors in the water.

In the New York Aquatic Plant Control Program the herbicide 2,4-D is applied at the rate of 1 to 2 gallons per acre (4-8 pounds acid equivalent) to control waterchestnut without any spreaders or stickers. The spray is directed at the exposed portion of the plants above the water. The 2 gal/acre-foot equals 2.94 mg/l to the upper acre foot of water being treated. It must be recognized that some portions of the river are in relatively rapid flow motion (the defined channel) and other portions undergo very slight flow motion (the backwater bay areas). The majority of the waterchestnut growth occurs in the relatively shallow portions of the river and is not restricted to backwater or channel areas. The areas of treatment (i.e., waterchestnut infestation) upstream from the water supply intakes are located upstream from the Crescent Dam and downstream from Lock 7. The 1500 CFS flow time-of-travel between Lock 7 and Crescent Dam is 170 hours or 7.08 days. Therefore, applications of herbicides up to the maximum permissible treatment per application shall be spaced at least 1 week apart to prevent production of high concentrations of herbicide in the treated water due to reapplication to the same water.

The only safe and rational approach to this conflict over noncompatible water uses (i.e., herbicides should not be introduced into sources of public water supply but the multiple use aspects of the resource demand some economical and practical control waterchestnut; judicious use of herbicides is the only known effective control for this nuisance plant at this time for large infestations) appears to be restriction of the herbicide dose to levels below the recommended USPHS

maximum acceptable concentration assuming uniform dilution throughout the entire river flow volume and all herbicide applied enters the water (the majority is supposed to be applied to exposed plants). Small infestations are controlled via hand pulling and removal by Environmental Conservation Department employees. 1500 CFS equals 970 mdg. Each 1 1/2 mile reach of the Lock 7 to Crescent Dam section of the river contains an average of 1,910 mil-gal. = (16.7 hrs) (1 day) (1.5 mile) (970 mil. gal.)

mile      24 hours      day

The 0.1 mg/l concentration of 2,4-D in water equals 0.834 lbs of acid per million gallons of water. Therefore the maximum amount of acid that should be applied to any 1 1/2 mile reach between Lock 7 and Crescent Dam is  $(1,010)(0.834) = 845$  lbs. application. Since each gallon of 2,4-D contain 4 lbs. of acid, the 845 lbs. application represents 105 acres to be treated per 1 1/2 mile reach. Recognizing that flow can easily vary from the average by at least 5%, the maximum acreage of waterchestnut infestations to be treated in any 1 1/2 mile reach between Lock 7 and Crescent Dam shall not exceed 100 acres.

Only the southernly half of the river affects the Latham Water District intake located on the southernly shore of the river. Since mixing of the water in this section of the river is minimal, no more than 50 acres shall be treated at any one time in any 1 1/2 mile reach of the southernly half of the river between Lock 7 and Mohawk View (Latham intake location) to preclude high dosages in localized areas. A maximum of 50 acres in the northernly half of the river may also be treated at the same time as the southernly half is treated in any 1 1/2 mile reach between Lock 7 and Mohawk View.

The power dam at Crescent produces good mixing of over 95% of the river flow upstream from the Cohoes intake. Thus any slug of material (2,4-D) in the water is redistributed and dispersed via mixing.

The "Rules and Regulations governing the Use of Chemicals for the Control and Elimination of Aquatic Vegetation" prohibit use of waters treated with 2,4-D (for drinking water purpose) for 24 hours after treatment. The Latham Water District treatment processes (aeration, rapid mix, flocculation, sedimentation, filtration and finished water storage) provide a detention of about 7 hrs. 48 minutes at 15 MGD (design rate) and 19 hrs. 30 minutes at 6 MGD (i.e., the present operating rate). This does not include detention in the transmission mains between the river intake and the first consumer. The additional detention of about 4 hrs 30 minutes can be obtained by not treating any water chestnut infestations in the main river channel (south side of river) for (4.5 hrs - 16.7 hrs/mile) 0.27 mile upstream from the intake. Hence infestations immediately upstream from the intake shall be removed manually rather than by chemical treatment if the river intake is in use. The detention provided by the intake canal and the treatment processes of the Cohoes plant exceeds 24 hours at current water production rates.

Continued cooperation between the Latham Water District, Albany County Health Department, State Health Department, and State Environmental Conservation Department regarding this matter will be made to achieve maximum public benefit.

Herbicide application periods and samples will be collected and analyzed to substantiate that excessive levels of herbicide do not enter the public water supply when applied in strict accordance with the following conditions:

- (1) The dose of 2,4-D shall not exceed 2 gallons/acre.
- (2) No 2,4-D shall be applied to the southerly portion of the main river channel for a distance of 1/4 mile upstream from the Latham Water District intake when it is in use.
- (3) All applications of 2,4-D shall be made proceeding upstream.
- (4) No more than 100 acres of waterchestnut in any 1 1/2 mile reach of the river between Lock 7 and Crescent Dam may be treated with 2,4-D during any single application.
- (5) No more than 50 acres of waterchestnut in any 1 1/2 mile reach of the southerly half of the river between Lock 7 and Mohawk View may be treated with 2,4-D during any single application.
- (6) Each application of 2,4-D shall be made at least 1 week after the previous application.
- (7) Treatment of the small pond located immediately north of the river and west of the Northway with 2,4-D shall not restrict treatment of 100 acres per 1 1/2 mile reach of river in the area since flow out of the pond into the river is essentially negligible.
- (8) The Environmental Conservation Department will notify the Albany County Health Department and the State Health Department (Bureau of Public Water Supply) of the proposed date of treatment at least one day in advance to permit water sampling and appropriate water treatment changes.

The Environmental Conservation Department agreed to the above-noted conditions for the 2,4-D applications made on July 10 and 27, 1970. These conditions shall continue in effect until additional supporting evidence indicates a need for revision to insure continued protection of

the public water supply customers of Latham Water District and the Cohoes Water Supply. No taste or odor complaints were received by either water purveyor affected following application of 2,4-D to the river during July, 1970.

## COMPARATIVE TESTS OF VARIOUS HERBICIDES CONTROL FOR WATERCHESTNUT

### The Plant

Waterchestnut (Trapa natans) was introduced into New York about 1884 and is now established in some areas of Massachusetts, Maryland, Virginia and Vermont. It seriously interferes with fishing, waterfowl hunting, boating, swimming and other use of waters by forming impenetrable mats of vegetation during the summer and early fall. The plant is an annual and decays after frost leaving an abundant crop of its large, thorny seeds. Many of these sprout the next spring, but there is also some delayed germination over a period of several years. Complete eradication has been achieved in a number of areas by destroying the plants prior to seed production for several successive years. The methods generally used in control programs have been spraying with 2,4-D or underwater cutting of heavy infestations and handpulling of light infestations. Control projects are currently in operation in New York, Vermont and Maryland.

Details on earlier control work in New York including tests of methods are given by Smith (1). The development of improved, low-cost methods might be expected to increase the chances of successfully eradicating these large infestations. There has been an increasing number of requests by property owners and others for information on methods for combatting waterchestnut, and it is expected that the development of improved methods would result in considerable control work by individuals as well as by state agencies.

In planning the present tests, published and unpublished information from several sources was available. Published work by Smith has already been mentioned. Further testing on a field basis was done in the New York control project during 1956 and 1957. In 1956 and 1957, tests were made in Maryland by Steenis.

Any successful method for eradication of waterchestnut must stop seed formation. To be practical for large-scale application it should be rapid, economical and safe with reference to personnel to adjoining property and to other uses of water. Although a number of methods currently used in control projects meet these requirements reasonably well for certain situations, the testing of new and better methods is considered desirable. It should be emphasized that a number of the tests made were of a preliminary nature, and it is not possible at this time to include a full comparision of relative effectiveness or costs on a field application basis.

#### Method of Spraying

The spray method used by the control project of the New York State Conservation Department during 1958 affords a useful basis for comparing other materials or methods of application and will be discussed first. This emulsion spray was formulated as follows: 2/3 gallon 2,4-D (mixture of isopropanol and di-isopropanol amine at 4 lbs. acid equivalent per gallon), 2 gallons kerosene, 1 pint Igepal CO-530 emulsifier (Antara Chemical Company) and 20 gallons water. This totals slightly over 22-2/3

gallons, but water was not measured with exact precision in field use and, hence, the spray tank load could be considered to be about 23 gallons. The procedure followed in mixing was to put in about 10 gallons of water, to add the 2,4-D and the Igepal dissolved in kerosene, and then to pour in the other 10 gallons of water. This gave a good emulsion.

Spraying was from a specially built 18-foot aluminum boom having 13 jets, mounted on 12-foot aluminum boat powered by a 4 horsepower air-propeller driven outboard motor. The speed was estimated at 3-1/2 miles per hour. The apertures used in most of the spraying were T jet No. 8004. As a hose spray had been used before the spray boom was devised, the pump was of a high-pressure type with a gauge which was not accurate for exact reading at low pressure. It was estimated, however, that pressure was about 30 p.s.i. When allowance is made for factors such as over-lap in spraying and variability in speed, the rate of application was estimated at about 4 pounds per acre.

In most water where the emulsion spray was used effectively in 1958, it is concluded that both surface and submerged effects were involved. It was particularly evident that "spot spraying" of scattered plants was not so effective as treatment of entire areas of dense growth even though the spray boom wet the leaves equally well under both conditions. In spot spraying, the underwater effect of the spray would be quickly dissipated by diffusion into adjacent untreated waters, whereas in treating larger areas more effective concentrations of 2,4-D are maintained. However, a weakening of the submerged effect by diffusion in

deep water occurs and would explain the sprouting of weak, lateral rosettes which was found to occur repeatedly. In some areas one application, properly timed to prevent such lateral rosettes from setting seed, gave successful control. Although early spray applications (mid-June) were successful in greatly decreasing the seed crop, a second spraying to destroy lateral rosettes late in the season would be necessary for complete suppression of seed.

#### Small Plot Tests

Two areas of the Mohawk River where waterchestnut growth was dense and where there was little chance of interference with observations over a long period were selected for test plots of 1/100-acre size (21 x 21 feet). These were at Allen's Cove near Crescent, and Wagar's Cove near Vischers Ferry. Numbered stakes were used to mark the plots. A number of chemicals were tested, most of them at several rates of application expressed as pounds of active ingredient or of acid equivalent per acre. The materials used fall into three groups: (1) granular formulations, (2) sprays of solutions or of emulsions, and (3) invert emulsion sprays (herbicide dissolved in water and enclosed in oil droplets).

#### Granular Formulations

a. 2,4-D (Amchem M-518c), butoxyethanol ester without emulsifier on 8-15 mesh attaclay, 10% acid equivalent. At the time of first series of treatments on May 21 some sprouting had taken place but no rosettes had reached the surface. Tests in New York, Maryland and Vermont included rates of 4, 8, 12, 16 and 20 lb./A. Effect ranged from none to a slight reduction. A few thickened leaves indicated some distortion.

A single plot at the 40 lb./A. rate was treated in New York on June 17 when young rosettes were at the surface. Control was excellent. An area at least four times as large as the plot was clear at the first check on July 15 and remained clear.

b. 2,4-D diethanolamine salt (2%), 2,4,5-T triethylamine salt (0.66%) on fine vermiculite. At the time of application on July 15 in New York waterchestnut covered the surface. Rates were 4, 8, 12 and 16 lb./A. Control was excellent. An area of water at least five times as large as the original plots was cleared and remained clear. Rates of application could not be evaluated separately because of the large amount of diffusion.

c. Silvex, 10% on 8-15 mesh attaclay. Plots at 2, 4, 8, 12, 16 and 20 lb./A. rate were treated on May 22 and at a 40 lb./A. rate on June 17 in New York. There was only a slight reduction in density of plants at the 20 and 40 lb./A. rates.

d. CBMM (Chipman Chlorea) in granular form. Plots at 50,100 and 150 lb./A. rates were treated on June 17 in New York with no effect.

e. TBA (Amchem Benzac 103, polychlorobenzoic acids), 25% on 15-30 mesh attaclay. Plots at 3, 6 and 12 lb./A. rates were treated on May 21 with no effect.

#### Liquid Formulations.

a. 2,4-D butoxyethanol ester in water. Plots were treated on July 15. When checked on September 12, rosettes were mostly killed or disintegrating, but some seeds of possible viability were still attached. These plots were in a zone of diffusion from the plots treated

with 2,4-D and 2,4,5-T on vermiculite and could not be evaluated precisely. The 8 lb./A. plot had a few seeds, but the 4 lb. and 2 lb./A. plots nearer the plots of 2,4-D and 2,4,5-T on vermiculite were clear of plants. Applications made in Maryland on June 4, 1956 at 4 and 8 lb./A. rates gave complete control at the higher rate and nearly equal control at the lower rate. A preliminary trial at a 4 lb./A. rate in which triethanolamine was added to 10 ratio gave complete control.

b. 2,4-dichlorophenoxy acetamide (Amchem Emid, wettable powder).

Applications were made on July 15 and checked on September 12. Most rosettes were killed, but some plants showed continued growth and formed weak lateral rosettes. Some seeds of possible viability were still attached. The 8 lb./A. rate was slightly better than the 4 lb./A. rate which in turn was slightly better than the 2 lb./A. rate.

c. MCPA in water. Applications were made on July 15 and checked on September 12. Many plants had disintegrated, but some seeds of possible viability were attached and some rosettes were recovering. The 8 lb./A. rate was definitely best with the 4 lb./A. rate slightly better than the 2 lb./A. rate.

d. Dalapon (soluble powder). An application at a rate of 6 lb./A. was made on July 16 and checked on September 12. This treatment was ineffective.

e. TCA (wettable powder). Applications at a rate of 5 lb./A. were made on July 16 and checked on September 12. These treatments were ineffective although rosettes showed some damage.

f. Sodium salt of 2,4-dichloroisobutyric acid (Rohm & Haas FW-450, wettable powder). Applications at a rate of 10 lb./A. were made on July 16 and checked on September 12. These treatments were ineffective since rosettes showed only slight damage.

#### Invert Emulsion Sprays

a. Invert 2,4,5-T technical (Dow Inverton 245). Applications were made on July 16. Treatments at rates of 1/2, 1, 2 and 4 lb./A. resulted in partial control. Many rosettes were recovering, and some seeds of possible viability were still attached on September 12.

b. Invert 2,4-D butoxyethanol ester. (Amchem). Applications were made on July 16. Treatments at rates of 1, 2, 4 and 8 lb./A. resulted in partial control. Most of the rosettes were killed but some were recovering and some seeds of possible viability were still attached on September 12.

#### Evaluation

In evaluating results and drawing conclusions it is important to bear in mind that the trials on a small plot basis were for the most part exploratory and that close standardization of conditions was not always possible because of variable weather and other uncontrollable factors. The timing of treatment with reference to the growth stage of waterchestnut was one important variable.

Interpretation of data from 1/100 acre plots is not considered directly applicable to large-scale treatment since experience has indicated that large areas generally show a better response. If a chemical does show good control at a given rate in a small plot or even

reaches beyond the boundaries of a plot, it would probably give better control on a large application at a reduced rate per acre where diffusion into adjoining untreated areas of water is not possible.

With limitations of the above mentioned types in mind we can summarize conclusions:

- (1) Of all the chemicals tested 2,4-D gave the best results.
- (2) Only 2,4-D in formulations of attaclay and vermiculite granules gave a complete kill characterized by no regrowth. However, early treatment with a relatively insoluble formulation of 2,4-D on attaclay failed to give control even though it might have been expected to remain active for a long period. On the basis of the one later application in June at a heavy rate (40 lb/A.) it is clear that 2,4-D pellet treatments have good possibilities. Vermiculite impregnated with soluble 2,4-D was tried only in July on dense stands but gave excellent results.

These results with vermiculite containing a soluble form of 2,4-D (amine salt) suggest that perhaps attaclay pellets impregnated with more soluble or emulsifiable forms than those tested constitute a promising field for further experimentation.

- (3) Conventional sprays of 2,4-D in water, kerosene-water emulsion or kerosene gave effective results although generally did not stop all regrowth. The sprouting of lateral rosettes is an important factor to be considered, but proper timing of sprays can avoid any setting of seed by these before killing of the plants by frost.

(4) Invert emulsion sprays of 2,4-D destroyed or damaged rosettes of water chestnut but did not stop regrowth and are considered only partially effective. Where wave action might wash off the usual types of sprays, invert emulsion sprays may have good possibilities for application on a repeated basis.

SUMMARY OF REGISTERED 2,4-D FORMULATIONS

1. Formulations(s) and Product(s) of Interest

a. 2,4-D, dimethylamine salt (DMA)

1. Liquid, diluted in water; 4 lbs. a.e./gal.

2. Dow Chemical Co. ("DMA 4 Herbicide"), EPA Reg. No. 464-196  
AB.

Amchem Products, Inc. ("Weedar 64"), EPA Reg. No. 264-2 AA.

Balcom Chemicals, Inc. ("Amine 4, 2,4-D Weed Killer"), EPA  
Reg. No. 960-163

Chipman Division of Rhodia Inc. ("2,4-D Amine No. 4"),  
EPA Reg. No. 359-331

Transvaal Inc. ("Weed-Rhap A-4D Herbicide"), EPA Reg. No.  
11687-6 AA

b. 2,4-D butoxyethanol ester (BEE).

1. Granular; 20% a.e. by weight.

2. Amchem Products, Inc. ("Aqua-Kleen"), EPA Reg. No. 264-119

2. Uses under Current Registrations(s)

a. 2,4-D--Labels provide for control of annual and perennial  
broadleaf weeds on drainage ditchbanks, marshes, still water lakes and  
ponds. (1-4 lbs. a.e./acre--drainage ditches and marshes; 2.0-45.0 lbs.  
a.e./acre--still-water lakes and ponds.

b. Weedar 64 label provides for control of weeds and brush on  
irrigation canal ditchbanks in the seventeen Western States (1-4 lbs.  
a.e./acre)

c. Weedar 64 label provides for water hyacinth control in ponds, lakes, reservoirs, marshes, bayous, drainage ditches, canals, rivers and streams that are quiescent or slow moving (1-4 lbs. a.e./acre)

3. Current Residue Tolerances

Residue tolerances are established for a wide variety of raw agricultural commodities (40 CFR 180.142). A tolerance of 0.1 ppm for residues in potable water has been established for use of the dimethylamine salt formulation on irrigation ditchbanks in 17 Western States (37 FR 12310, June 22, 1972), and for water hyacinth programs conducted by Federal, State, or local public agencies in ponds, lakes, reservoirs, marshes, bayous drainage ditches, canals, rivers and streams that are quiescent or slow moving (40 FR 50121, October 28, 1975). A tolerance of 0.1 ppm (37 FR 12311, June 22, 1972) has been established for residues which may occur in or on raw agricultural commodities (40 CFR 180.142C). A tolerance of 1.0 ppm was established for residues in fish and shellfish (40 FR 50099-50100, October 28, 1975).

4. Contemplated and Potential Uses

a. U.S.B.R. is pursuing amended registration of the DMA salt formulation for use on irrigation ditchbanks with several listed registrants.

b. Under EPA Experimental Use Permit No. 11683-EUP-1, USBR is pursuing a research program to control Eurasian watermilfoil at Fort Cobb Reservoir in Oklahoma with the DMA and BEE formulations.

5. Pending Experimental Permit, Tolerance, and Registration Actions

In connection with the proposed control of Eurasian watermilfoil in potable water reservoir systems, the Tennessee Valley Authority has submitted to EPA Pesticide Petition No. 3E1390 proposing to establish a tolerance for residues of the herbicide 2,4-D in clams, fish, mussels, and oyster at 1 ppm and Food Additive Petition 3H5032 proposing a tolerance for residues of the herbicide in potable water at 0.1 ppm. The proposed label with the petition makes reference to the use of two formulations (DMA and BEE) for controlling Eurasian watermilfoil at rates of application of 5 to 40 pounds of acid equivalent per surface acre. The proposed label would restrict the use of these two formulations of 2,4-D to the Tennessee River and its tributaries by the Tennessee Valley Authority.

In connection with the irrigation ditchbank use, USBR is pursuing with several listed registrants to amend their registration of the DMA salt formulation to include the above use pattern. At present only Weedar 64 is registered for use on irrigation canal ditchbanks in the seventeen Western States.

NOTICE TO PESTICIDE REGISTRANTS (5 APRIL 1976)

In accord with Section 4(c)(2) of the Federal Insecticide, Fungicide and Rodenticide Act, as amended, and the regulations for registration and classification of pesticides (40 CFR 162), all presently registered pesticide products are required to be reregistered or cancelled. So that reregistration may proceed in an orderly and efficient manner, this Agency will call in groups of products according to a schedule, and is requiring that registrants submit their applications for reregistration within 60 days of receipt of their request. This document is such a request for products encompassed with the limits defined above. Refer to the Notice of Reregistration Call-in for a list of your products in this Batch.

(1) Review of the Label

Our aim in preparing this document, is to provide you, the registrant, with specific information regarding reregistration of your individual products(s), so that if you comply with these instructions, you may attain reregistration as a result of your initial submission. However, this can not be accomplished unless you have become familiar with the Section 3 Regulations and the General Instructions Package.

After reviewing the information discussed above, please determine which products you wish to reregister.

If you decide not to apply for reregistration for one or more of the products listed above, please send a written request to cancel the registrations(s) to the address below.

When reregistration is desired, the application for reregistration should be completed and returned to the following address with 60 days of the date of receipt of this notice.

## INSTRUCTIONS

### PART A - FORMS

For each product listed above, submit one completed copy of each of the following forms for each product proposed for reregistration, together with the labeling and data set forth below:

1. Application for New Registration (EPA Form 8570-1) Note:  
Box 1 on this form should be completed by entering the batch number from the notice of reregistration call-in.
2. Addendum to the Application form, including citations of supporting data and the revised Offer to Pay Reasonable Compensation.
3. Confidential Statement of Formula (EPA Form 8570-4).
4. Label Technical Data Sheet (EPA Form 8570-10).

Sufficient forms are included for your products in this Batch. Additional forms may be obtained from the Registration Division through the above address.

### PART B - LABELING

#### (1) Procedures for Submitting Labeling

For each product, submit two (2) copies of labeling, in draft form only. We will inform you when to submit finished labeling. ANY ADDITIONS OR CHANGES FROM YOUR PREVIOUSLY ACCEPTED LABEL, OTHER THAN THOSE REQUIRED BY THE REGULATIONS AND/OR THIS GUIDANCE PACKAGE, MAY RESULT IN DELAYS IN REVIEW AND PROCESSING OF YOUR APPLICATION(S). IN ANY CASE, CHANGES OR ADDITIONS MUST BE PROPOSED IN A SEPARATE APPLICATION FOR AMENDED REGISTRATION (EPA FORM 8570-11).

If your application and draft labeling are acceptable, you will be instructed either by telephone or by letter to submit five (5) copies of the final printed labeling, incorporating any specified revisions.

If your draft labeling is acceptable without further revision, you may certify that your final printed labeling is identical to the accepted draft, and further expedite your reregistration. The following certification statement may be used at such time as you submit final printed labeling, provided you have first been notified by this office that draft labeling is acceptable without revisions:

"I certify that the attached printed labeling is identical in all respects to the draft labeling as accepted by the Registration Division. It is understood that if this statement is known by me to be false, I may be subject to criminal penalty under 18 U.S.C. Section 1001, or criminal or civil penalty under 7 U.S.C. Section 136j(a) (2)(1) (signature of applicant or his authorized representative)"

(2) Contents of Label

Consult the Label Format Chart in The General Instructions Package for the required or preferred placement of the text of the label as set forth below. The appropriate wording of each labeling element is specified in the indicated items. The following items are numbered the same as the numbers on the sample label and the Label Format Chart. Please read the following information carefully and prepare your labeling accordingly.

- ITEM 1 - PRODUCT NAME
- ITEM 2 - COMPANY NAME & ADDRESS
- ITEM 3 - NET CONTENTS
- ITEM 4 - PRODUCT REGISTRATION NUMBER
- ITEM 5 - PRODUCING ESTABLISHMENT REGISTRATION NUMBER
- ITEM 6a - INGREDIENT STATEMENT
- ITEM 6b - POUNDS PER GALLON STATEMENT
- ITEM 7 - FRONT PANEL PRECAUTIONARY STATEMENTS
  - ITEM 7a - CHILD HAZARD WARNING STATEMENT
  - ITEM 7b - SIGNAL WORD
  - ITEM 7c - SKULL & CROSS BONES AND WORD POISON
  - ITEM 7d - STATEMENT OF PRACTICAL TREATMENT
  - ITEM 7e - REFERRAL STATEMENT
- ITEM 8 - SIDE/BACK PANEL PRECAUTIONARY LABELING
  - ITEM 8a - HAZARD TO HUMANS & DOMESTIC ANIMALS
  - ITEM 8b - ENVIRONMENTAL HAZARD
  - ITEM 8c - PHYSICAL OR CHEMICAL HAZARD
- ITEM 9a - RESTRICTED BLOCK
- ITEM 9b - STATEMENT OF CLASSIFICATION
- ITEM 9c - MISUSE STATEMENT
- ITEM 10a - RE-ENTRY STATEMENT
- ITEM 10b - CATEGORY OF APPLICATOR
- ITEM 10c - STORAGE & DISPOSAL BLOCK
- ITEM 10d - DIRECTIONS FOR USE AND OTHER MISCELLANEOUS INFORMATION

Item 1. PRODUCT NAME - The name, brand, or trademark is required to be located on the front panel, preferably centered in the upper part of the panel. In certain instances, the name of a product may be considered a claim for the product, and will not be accepted if it represents claims which may be false or misleading. See the regulations at 162.10(b).

Item 2. COMPANY NAME AND ADDRESS - The company name and address of the producer, registrant or person for whom produced is required on the label. It is preferred that the name and address be located at the bottom of the front panel, or at the end of the label text. If the registrant is not the producer, the name on the label must be qualified by "packed for xxx", "Distributed by xxx", or similar statements as appropriate. See the regulations at 162.10(c).

Item 3. NET CONTENTS - A net contents statement is required on all labels. It is preferred that it be located at the bottom of the front panel immediately above the company name and address, or at the end of the label text. The net contents must be stated in terms of weight, expressed as avoirdupois pounds and ounces, or in terms of conventional liquid measure, expressed as gallons, quarts, pints and fluid ounces, and stated in terms of the largest suitable unit, i.e., "1 pound 10 ounces" rather than "26 ounces". In addition to the required units specified, net content may be expressed in metric units. See the regulations at 162.10(d).

Item 4. PRODUCT REGISTRATION NUMBER - The registration number assigned to the pesticide product at the time of registration must appear on the label, preceded by the phrase "EPA Registration No.," or the phrase "EPA Reg. No." The registration number must be set in type of size and style

similar to other print on the part of the label on which it appears and must run parallel to it. The registration number and the required identifying phrase must not appear in such a manner as to suggest or imply recommendation or endorsement of the product by the Agency. See the regulations at 162.10(e).

Item 5. PRODUCING ESTABLISHMENT REGISTRATION NUMBER - The producing establishment registration number, preceded by the phrase "EPA Est" of the final establishment at which the product was produced, may appear in any suitable location on the label or immediate container, but not on the cap or lid of the container. It must appear on the wrapper or outside container of the package if the EPA establishment registration number on the immediate container cannot be clearly read through such wrapper or container. See the regulations at 162.10(f).

Item 6a. INGREDIENT STATEMENT - An ingredient statement which contains the name and percentage by weight of each active ingredient, and the total percentage by weight of all inert ingredients, is required on the front panel. It is preferred that it be located immediately below the product name.

The text of the ingredient statement must run parallel with other text on the panel on which it appears, and must be clearly distinguishable from and must not be placed in the body of other text. See the regulations at 162.10(g).

Item 6b. POUNDS PER GALLON STATEMENT - If in the directions for use the application rates are stated in weight of pesticide per unit area, the pounds per gallon (weight of active ingredient per unit volume) must appear in the ingredient statement, e.g. Pounds/Gallon.

Not required for dry formulations, W.P., dust or granular products.

Item 7. FRONT PANEL PRECAUTIONARY STATEMENTS - All labels are required to bear on the front panel certain precautionary statements as described below. These front panel statements must be grouped together, preferably within a block outline, and must appear in the minimum type sizes specified in the General Instructions Package and in the regulations.

Item 7a. CHILD HAZARD WARNING STATEMENT - All labels are required to have the statement "Keep Out of Reach of Children" located on the front panel above the signal word. See the regulations at 162.10(h) (1)(ii).

Item 7b. SIGNAL WORD - The following signal word is required on the front panel immediately below the child hazard warning statement. See the regulations at 162.10(h)(1)(i).

#### CAUTION

Item 7c. SKULL & CROSS BONES AND WORK "POISION"

N/A

Item 7d. STATEMENT OF PRACTICAL TREATMENT

In case of contact, wash skin with soap and water; for eyes flush with water for 15 minutes and get medical attention.

Item 7e. REFERRAL STATEMENT - The statement "See Side (or base Panel for Additional Precautionary Statements" is required on the front panel for all products, unless all required precautionary statements appear on the front panel. Refer to the Label Format Chart in the General Instructions Package.

Item 8. SIDE/BACK PANEL PRECAUTIONARY LABELING - The precautionary statements as listed below must appear together on the label under the heading "PRECAUTIONARY STATEMENTS". It is preferred that they appear at the top of the side or the back panel, preceding the directions for use, and that they be surrounded by a block outline. Each of the three hazard warning statements must be headed by the appropriate hazard title. See the regulations at 162.10(h)(2).

Item 8a. HAZARD TO HUMANS AND DOMESTIC ANIMALS - The following precautionary statement(s) is required on your label:

HAZARD TO HUMANS & DOMESTIC ANIMALS

CAUTION

For dry formulations: Avoid contact with skin, eyes or clothing.

Avoid breathing dust.

Wash thoroughly after handling.

For liquid formulations: Harmful if swallowed.

Avoid contact with skin, eyes or clothing.

Avoid breathing spray mist.

Wash thoroughly after handling.

Item 8b. ENVIRONMENTAL HAZARD.

Refer to the following tables for the appropriate environmental cautions for your product. (Select the environmental caution appropriate for the active ingredient and use of your product, and place those statements on your label)

3. Active Ingredients of the Label

2,4-D esters (except 2,4-D isooctyl  
isooctyl ester) and ester and all salts  
N,N-dimethyl oleyl- (except the N,N-dimethyl  
linoleyl amine salt oleyl-linoleyl amine salt)

Uses

Formulating	This pesticide is toxic to fish. Keep out of lakes, streams or ponds.	Keep out of lakes, streams or ponds.
Non-Aquatic	This pesticide is toxic to fish. Use with care when applying in areas adjacent to any body of water. Keep out of lakes, streams, or ponds. Do not apply when weather conditions favor drift from target area.	Keep out of lakes, streams or ponds. Do not apply when weather conditions favor drift from target area.
Aquatic	Fish and other aquatic organisms may be killed at application rates recommended on this label. Do not apply when weather conditions favor drift from target area.	Do not apply when weather conditions favor drift from target area.

Non-aquatic plus pond*	This pesticide is toxic to fish. Fish and other aquatic organisms may be killed at application rates recommended on this label. Keep out of any body of water not intended for (aquatic weed/algae) control. Do not apply when weather conditions favor drift from target area.	Keep out of any body of water not intended for (aquatic weed/algae) control. Do not apply when weather conditions favor drift from target area.
Pond*	Fish and other aquatic organisms may be killed at application rates recommended on this labels.  Do not apply when weather conditions favor drift from target area.	Do not apply when weather conditions favor drift from target area.

\*Pond - ornamental and/or farm Ponds with little or no outflow

Rice	<p>This pesticide is toxic to fish. Use with care when applying in areas adjacent to any body of water. Fish and other aquatic organisms may be killed by this pesticide. Keep out of lakes, streams, ponds, tidal marshes, and estuaries. Do not apply when weather conditions favor drift from target area.</p> <p>Do not apply when weather conditions favor drift from target area.</p>	Keep out of lakes, streams, ponds, tidal marshes, and estuaries. Do not apply when weather conditions favor drift from target area.
Aquatic plus Rice	<p>This pesticide is toxic to fish. Fish and other aquatic organisms may be killed at application rates recommended on this label. Keep out of</p>	Keep out of tidal marshes and estuaries. Do not apply when weather conditions favor drift from target area.

Aquatic plus      tidal marshes and estuaries.

Rice                Do not apply when  
                      weather conditions favor  
                      drift from target area.

Item 8c. PHYSICAL OR CHEMICAL HAZARD. All pressurized products, all other products with flash points under 150° F are required to have warning statements on the flammability or explosive characteristics of the product. Refer to the General Instructions Package for the appropriate physical or chemical hazard statements for your product.

Item 9a. RESTRICTED BLOCK -

1. Products with directions for aquatic use of 2,4-D (and its salts and esters) in lakes, ponds (other than ornamental and/or farm ponds with little or no outflow), reservoirs, canals, other bodies of water; and the use on rice are classified for restricted use. These products must bear the following statements on the front panel of the label:

2. Products with other uses, see item 9b.

Item 9b. STATEMENT OF CLASSIFICATION -

Nonaquatic uses of this product are classified for general use. The following statement must appear immediately below the heading "Directions for Use".

General Classification

Products intended for formulating and technical use are not required to be classified, refer to item 10d.

Item 9c. MISUSE STATEMENT - The following statement is required on your label and must be located immediately following the statement of classification if the product is registered for general use; if the product is classified for restricted use, this statement must appear immediately following the heading "Directions for Use." See the regulations at 162.10(i)(2)(ii).

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

Item 10a. RE-ENTRY STATEMENT -

N/A

Item 10b. CATEGORY OF APPLICATOR -

N/A

Item 10c. STORAGE & DISPOSAL BLOCK - All labels are required to bear storage and disposal statements. These instructions must be grouped and appear under the heading "Storage and Disposal" in the directions for use. This heading must be set in the same type sizes as required for the child hazard warning. Refer to the General Instructions Package for appropriate Storage and Disposal statements. Change the statement. "Do not contaminate water, food or feed by storage or disposal", to read "Do not contaminate water, food or feed by storage, disposal or cleaning of equipment." Add the following also:

Do not store near other pesticides or seeds.

Item 10d. DIRECTIONS FOR USE AND OTHER MISCELLANEOUS INFORMATION

1. Products intended for Formulating Use Only must bear the following statement on your label:

A Herbicide for Formulating Use Only

This statement must be followed by the misuse statement in item 9c.

2. If the label recommends tank mixing these herbicides with other products, then the following statement should be added to the directions for use:

Observe all cautions and limitations on labeling of all products used in mixtures.

3. If your product is intended for aquatic use the following statements must be added to the directions for use:

Treatment of (aquatic weed/algae) can result in oxygen loss from decomposition of dead (weeds/algae). This loss can cause fish suffocation. Therefore, to minimize this hazard, treat 1/3 to 1/2 of the

water area in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow fish to move into untreated areas".

NOTE: Consult your State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters."

4. If your product bears directions for pond use (ponds being ornamental and/or farm ponds with little or no outflow) the following statement is required.

Treatment of (aquatic weeds/algae) can result in oxygen loss from decomposition of dead (weeds/algae). This loss can cause fish suffocation. Therefore, to minimize this hazard, treat 1/3 to 1/2 of the water area in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas."

5. If your product contains directions for use on barley, oats, rye and wheat and the restriction: "Do not use treated straw for livestock feed", you should delete the restriction.

6. If your product contains directions for use as a herbicide in apple, pear, and quince orchards, add the following:

"Do not graze dairy cattle in treated areas for 14 days after application. Remove meat animals from freshly treated areas for 7 days before slaughter. Withdrawal is not needed if two weeks or more has elapsed since the treatment was applied. Do not cut treated grass for hay within 30 days after application.

7. If your product include directions for use on blueberries involving a revolving cloth covered drum, the following limitation must be added: Do not harvest any berries during treatment year or for a two year period between treatment and cropping.

Delete any present pre-harvest limitation conflicting with this statement.

If your product includes directions for use on blueberries involving any application other than the revolving cloth covered drum method, delete those directions.

8. If your product includes directions for postemergence use on corn, add the following limitation to those directions: Do not forage or feed treated corn fodder for 7 days following application.

9. If your product includes directions for use on grass seed crops, grass hay crops, pasture or rangeland, add the following limitations for these uses: Do not graze dairy cattle in treated areas for 14 days after application. Remove meat animals from freshly treated areas for 7 days before slaughter. Withdrawal is not needed if 2 weeks or more has elapsed since the treatment was applied. Do not cut treated grass for hay within 30 days after application.

Delete any present grazing restrict conflicting with the above.

10. If your product include directions for use in rice, add the limitation: Do not use in rice paddies where shellfish are of economic importance or where flood water is used for irrigation of other crops.

11. If your product contains lithium salt of 2,4-D with directions for postemergence, broadcast use in sorghum; such directions must be deleted.

12. If your product contains directions for use on corn, stipulate field, sweet and popcorn.

13. See the General Instructions dated 2/2/76 page 4-5, item 8 for further clarification of Directions for Use.

**PART C - DATA REQUIREMENTS AND WASY TO SATISFY THEM**

Listed below are the reregistration data requirements for products in this batch and, where possible, citations of specific studies from Agency files or from the literature which have been reviewed and found to be sufficient to satisfy the requirements. Where a particular data requirement is inapplicable, or where the Agency has initiated a waiver of a requirement, a brief rationale is included. When a batch includes products containing more than one active ingredient, a separate listing of requirements and citations is included for each ingredient.

Each application for reregistration must include specific citations of all supporting data which the Administrator is to consider. In the terms of the Agency's Interim Policy Statement on the implementation of Section 3(c)(1)(D) of FIFRA (38FR 31862, November 19, 1973) and the recent alterations to that policy (41 FR 3339, January 22, 1976) implementing the FIFRA amendments of HR 8841 (November 28, 1975), this means that either the 2(a) or 2(b) method of support must be used.

Special provision has been made to make it easier for you to cite the supporting data relied on. Attached to the application form is an addendum sheet, containing a revised offer to pay statement which supersedes the one provided on the face of the form. The addendum includes the following additional elements.

- (1) Batch Number: Enter from the Notice of Call-in for reregistration with this Guidance Package.
- (2) Registration Number: Enter the registration number of the product you are reregistering.
- (3) Active Ingredient: Enter the name of the active ingredient to which the data citations apply. If your product contains more than one active ingredient, a separate addendum page must be completed for each one.
- (4) Data Requirements: The basic reregistration data requirements are preprinted on the addendum form. If any additional requirements are indicated in this Guidance Package Bibliography, pursuant to section 162.8(d) of the regulations, enter these in the blank spaces at the bottom of the addendum form.
- (5) Response: In this field indicate the method of your response to each of the data requirements, choosing one of the following five alternatives:
  - (a) N/A: If this Guidance Package indicates the requirement is not applicable to your product, mark this response.
  - (b) Waived in Guidance Package: If this Guidance Package indicates the requirements has been waived on the initiative of the Agency, mark this response.
  - (c) Waiver Requested: If this Guidance Package does not include an Agency-initiated waiver and if you nonetheless wish to request a waiver of the data requirement, as provided in the regulations at 40CFR 162.8(a)(3), mark this response. If this response is marked, the application must be accompanied by a written rationale for the requested waiver.

(d) Cited from Guidance Package: If you wish the Agency to consider, in support of your application, data cited in this Guidance Package Bibliography, enter here the line numbers(s), of the specific study or studies addressing this data requirement. The line numbers appear in the Guidance Package Bibliography immediately to the left of the specific citations.

(e) Alternative Data Attached: If you wish the Agency to consider, in support of your application, data other than those cited in the Guidance Package Bibliography, mark this response and include with the application either copies of the alternative data or, if the data have been previously submitted to the Agency, specific citations of the data in the same format as the citations in this Guidance Package.

(6) Offer to Pay Statement: This statement is preprinted on the addendum form. The wording has been revised to reflect the November 28, 1975 amendments to Section 3(c)(1)(D) of FIFRA. A full explanation of these revisions can be found in the Federal Register of January 22, 1975, at p. 3339.

(7,8,9) Signature, Title, and Date: These entries must be completed on each addendum form, or the application will be returned without review. Signature constitutes a binding offer to pay reasonable compensation, as may be required, for the data cited in field #5 of this form.

In the itemized bibliography there may be some entries preceded by the symbol '\*TS'. This symbol indicates that either (a) an assertion has been made by the owner of the data, in accordance with Section 10(a) of amended FIFRA, that the data are, in his opinion, trade secrets or

commercial or financial information or (b) such as assertion of trade secrecy may be made by the owner of the data. The immediate effect of such an assertion is to prevent the public disclosure of the data in question and, if the data were submitted on or after January 1, 1970, in support of an application, to prevent the Administrator's consideration of the data in support of any other application without the owner's permission. Such an assertion by the owner of data can be overruled by the Administrator, as provided in Section 10(b) of the Act, but that judgment is appealable to the courts. Thus a considerable time might well elapse between the owner's initial assertion and the final resolution of disputes; during this period the data can neither be disclosed nor, if submitted on or after January 1, 1970, considered without consent.

If in support of your application for reregistration you choose to cite data marked with the '\*TS' symbol, you should include with your application a statement of permission from the data owner. This statement should be in writing, should be signed by the owner of the data, and should identify clearly both your application and the specific data with respect to which the permission is granted. In lieu of providing a statement of permission, you may choose to rely on the data listed and marked with the '\*TS' symbol with the clear understanding that reregistration may be substantially delayed pending final resolution of any dispute on the trade secrecy status of any item of test data.

Where it has been possible we have attempted to identify in the bibliographies other equivalent data with respect to which trade secrecy has not been asserted. It is also possible that some data identified

with the '\*\*TS' symbol will have been cleared for disclosure and consideration before you apply. If you cite such data without consent in anticipation that it will be cleared, there is a likelihood of substantial delays in the processing of your reregistration application. Thus either substitution of equivalent data or pursuit of permission from data owners is strongly recommended.

## CLASSIFICATION

### GENERAL/RESTRICTED

The law requires that during reregistration all products be classified, according to their use, as GENERAL or RESTRICTED. Products classified GENERAL may be used, in accordance with label directions and precautions, by any member of the general public. Products classified RESTRICTED may be used only by a certified applicator who has been trained in the use of such pesticides.

If your product bears directions for use on any of the sites listed in Column 1 below, it must be classified RESTRICTED, unless the criteria given in Column 2 can be fulfilled. Where it is not possible to change a site or use from RESTRICTED to GENERAL classification, it will be so stated in Column 2.

<u>Site or Use</u>	<u>This use may be classified General provided that:</u>
1. Aquatic	1. No classification change possible.
2. Rice	2. No classification change possible.
3. Ponds	3. The label must limit the aquatic use to ornamental and/or farm pond use with little or no outflow.

SPECIAL REVIEW OF DATA REQUIREMENTS FOR 2,4-D 28 MAY 1980

The FIFRA Scientific Advisory Panel completed a special review of possible data gaps with 2,4-D to determine test requirements needed to support continued registration of the pesticide. The review was completed in an open meeting of the Panel held in Arlington, Virginia, on May 28, 1980.

Maximum public participation is encouraged at all meetings of the Scientific Advisory Panel. In respect to this session, the meeting was announced in the Federal Register on May 12, 1980. In addition, the secretariat of the Panel routinely sends telephonic notices and special mailings to members of the general public who have indicated an interest in activities of the Panel.

Written and oral statements were received from Dr. Dieter Riedel of the Occupational Toxicology Division, Environment Health Directorate of Canada; the National Forest Products Association; and from technical staff of the Environmental Protection Agency.

The excellent briefings by Mr. Johnson, Deputy Assistant Administrator for Pesticide Programs (OPP), in company with Ms. Anne Barton, Ms. Anita Schmidt and Dr. Henry Spencer of his staff, were of great value to members of the Panel.

In consideration of all matters brought out during the meeting, the Panel unanimously submits the following report in response to specific proposals by the Agency for certification of test requirements involving studies on oncogenicity; reproductive effects; mutagenicity; metabolism; neurotoxicity; acute toxicity; and dermal absorption:

Oncogenicity Test Requirements under Review by the Agency:

1. Standard oral exposure studies of acid in rats and mice.
2. A subcutaneous or dermal exposure study of iso octyl ester in mice.

Panel Comments:

The agency has suggested three oncogenicity studies in the list of proposed data requirements for 2,4-D: (1) standard oral exposure studies of acid in rats; (2) in mice; and (3) a subcutaneous or dermal exposure study of the iso octyl ester in mice. The FIFRA Scientific Advisory Panel concurs with the need for a cancer bioassay study in mice since neither the Innes et al. nor the Archipov and Kozlova studies provide sufficient information to make a meaningful scientific judgment. The Scientific Advisory Panel has noted previously the difficulty of using data from the Innes et al. study as the basis for evaluating oncogenicity in mice and would urge the Agency to avoid using data from this study for either a positive or negative determination of oncogenicity for any of the agents included in this study.

The FIFRA Scientific Advisory Panel does not concur with the Agency suggestion for a subcutaneous or dermal exposure study of the iso octyl ester of 2,4-D in mice for several reasons. First, oncogenicity bioassays using the subcutaneous or dermal routes of exposure are generally less reliable than the standard oral test in predicting oncogenicity in any species. Second, the basis for this requirement appears to be a peripheral study which was added to the Innes et al. study on 2,4-D and which has serious defects (single sex, single dose, questionable controls, etc.) in addition to those generally associated with the Innes et al. protocol and evaluation. As indicated above, the

the FIFRA Scientific Advisory Panel recommends against the use of data from this study for oncogenicity evaluation of any of the agents included in the tests.

The FIFRA Scientific Advisory Panel has reviewed the chronic toxicity study on 2,4-D carried out in rats and dogs by Hansen et al. which was published in Toxicology and Applied Pharmacology (TAP). In addition to peer review of this study by the editor and editorial board of TAP, the study has also been reviewed by the National Cancer Institute (NCI) and by Dr. M. Rueber. The NCI review agreed with the conclusion of the authors of this paper that a carcinogenic effect was not demonstrated for 2,4-D whereas Dr. Rueber's conclusion was that 2,4-D is carcinogenic in male and female rats and probably also in mice. In Dr. Rueber's report, he agreed (page 5) that this FDA study (Hansen et al.) must be considered as an acceptable study, and thus the major difference in the conclusions of Dr. Rueber and the authors of this study derives primarily from differences in the interpretation and evaluation of the rat histopathologic data. Dr. Rueber agrees with the authors of the FDA study that 2,4-D was not shown to be carcinogenic in dogs but argues that two years is an insufficient study period to detect carcinogenesis in this species. It should be pointed out that carcinogenic effects have been produced in dogs in studies of less than 2 years duration and the 2-year period is the recommended exposure period in the current FIFRA guidelines for chronic toxicity studies in dogs. The FIFRA Scientific Advisory Panel recommends that the Agency attempt to resolve the apparent controversy between Dr. Rueber's pathologic interpretation of the rat histologic findings and those of the authors of the FDA study before requesting any additional oncogenicity testing in rats with 2,4-D.

In connection with the issue of additional oncogenicity testing with 2,4-D in rats, the FIFRA Scientific Advisory Panel wishes to remind the Agency that it is virtually impossible to carry out a chronic toxicity study that is totally without flaws. The decision of whether these flaws are inconsequential or whether they render the study useless for toxicologic evaluation depends both on the judgment and experience of the evaluator and on the rest of the information contained in the toxicity data base. Thus, the existence of "data gaps" and "inadequate studies" in a toxicity data base for a compound does not a priority preclude a toxicologic evaluation of the compound, although it should increase the "uncertainty factor" of safety factor associated with any predictive effort. The FIFRA Scientific Advisory Panel supports the efforts of the Agency to improve the quality of the toxicity data base through mechanisms such as the identification of "data gaps", the development of guidelines for toxicity testing protocols, and the RPAR process, but it is equally aware of the fact that the requirement of additional animal studies which are not clearly justified will waste resources which are already in short supply and damage Agency credibility.

It is recommended, therefore, that in establishing requirements for additional toxicity studies the Agency distinguish between those requirements which it considers to be essential (need to know) and those which it considers to be desirable (nice to know). This priority ranking should also provide an indication of the urgency associated with the requirement for additional testing. This approach would provide the Agency with greater flexibility in dealing with the older pesticides (like 2,4-D) which have a relatively good "track record" in terms of producing adverse effects on human health and the environment.

SUMMARY OF PANEL COMMENTS:

The Panel is of the opinion that the Agency should resolve the controversy between the study conducted by Hansen et al, 1971 and the pathologic interpretation of that study by Reuber 1979 prior to certification that additional oncogenicity studies are required. In the event the results of the oncogenicity studies of Hansen et al. 1971 are validated as a result of examination of the appropriate slides related to lymphosarcoma in female rats, then the Panel would recommend that the testing requirement be limited to a standard oral exposure study in mice. In the event the results of the report by Hansen et al, 1971 are not validated on reexamination of tissue specimens, then an oral exposure study in both rats and mice is recommended.

Reproduction Test Requirements under Review by the Agency:

1. A multigeneration study to establish NOELS for the acid form of 2,4-D in one species.
2. Teratology/fetotoxicity studies to establish NOELS in rats for:
  - a. Acid
  - b. Butoxy Propyl Ester
  - c. Alkanol Amine
  - d. Isopropyl Ester
  - e. Dichlorophenol metabolite

Panel Comments:

The Panel is of the opinion that an additional multigeneration study to establish NOELS for the acid form of 2,4-D in one species is not warranted. Although the Hansen et al study had some discrepancies, is still represents an adequate study of the potential reproductive hazard of 2,4-D. The study shows a statistically significant effect at 1500 ppm.

However, except for the F1 generation, 500 ppm and 100 ppm of 2,4-D do not cause any reproductive anomalies. In our opinion 500 ppm should be considered as a no observed effect level (NOEL) for reproductive toxicity in rats exposed to 2,4-D and should be used in estimating the potential reproductive toxicity of 2,4-D to humans exposed to this compound.

The Panel concurs that teratology/fetotoxicity studies to establish NOELS in rats should be conducted in all the proposed data requirement areas.

Mutagenicity Test Requirements under Review by the Agency:

None

Panel Comments:

The Panel concurs with the appraisal by the Agency.

Metabolism Test Requirements under Review:

1. Standard metabolism studies in dogs and rats for acid, isoctyl ester and PGBE.
2. A standard metabolism study in pregnant rats for acid, isoctyl ester, and PGBE.

Panel Comments:

The Panel agrees with the appraisal by the Agency for standard metabolism studies in dogs and rats for acid, isoctyl ester, and PGBE. However, the Panel is of the opinion that standard metabolism studies in pregnant rats should not be done.

Neurotoxicity Test Requirements under Review by the Agency:

1. Subchronic neurotoxicity studies in dogs, rats and chickens by oral route (including a recovery period) for acid and dimethylamine.
2. A subacute dermal neurotoxicity study in dogs.

Panel Comments:

The Panel agrees that subchronic neurotoxicity studies in dogs, cats, rats, and chickens by the oral route (including a recovery period) for acid and dimethylamine should be conducted. However, the Panel is of the opinion that the subacute dermal neurotoxicity study in dogs should be delayed or not conducted.

Acute Toxicity Test Requirements under Review by the Agency:

1. Oral LD<sub>50</sub> in rats for each formulation.
2. Dermal LD<sub>50</sub> in rats for each formulation.

Panel Comments:

The Panel concurs with the appraisal by the Agency for acute toxicity data.

Dermal Absorption Test Requirements under Review by the Agency:

A radiolabeled dermal absorption study in an appropriate species for each formulation meeting the following criteria:

1. It contains an active ingredient which has shown fetotoxic effects at relatively low doses (this includes all 2,4-D forms included in the teratology study request plus the iso octyl ester and PGBE).
2. Its use is likely to result in dermal exposure to human females

Panel Comments:

The Panel concurs with the appraisal by the Agency for dermal absorption data.

Fish and Wildlife Comments:

The Panel is concerned about the potential adverse effects of 2,4-D to fish and wildlife. The Panel notes a potentially serious data gap in this vital area and respectfully requests that the Agency review the

matter and present a report on possible studies to be conducted at a future meeting of the Panel.

Selected References:

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2. HANSEN, W. H., M. L. Quaife, R. T. Habermann and O. G. Fitzhugh. 1971. Chronic toxicity of 2,4-dichlorophenoxyacetic acid in rats. *Toxicol. Appl. Pharmacol.* 20:122-129.
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The research study, Hansen, W. H. Quaife, M. L. Havermann, R. T. & Fitzhugh O. G. (1971), Chronic toxicity of 2,4-dichlorophenoxyacetic acid in rats and dogs. Toxic. appl. Pharmac. 20,122, Reported on chronic toxicity effects of this herbicide coupled with a multigeneration reproduction study. The technical grade 2,4-D used was free of 2,-7dichloro-and2,3,7,8-tetrachlorodibenzo-p-dioxin.

Feeding of dietary levels of 5, 25, 125, 625 or 1250 ppm 2,4-D for 2 yr to rats had no adverse effect on growth, haematology, survival, organ weights or pathology and on the pattern of tumour development. The tendency for the proportion of tumour-bearing animals to rise with increasing dietary leveals of 2,4-D was not considered to reflect important pathological differences. Dogs fed 10,50, 100 or 500 ppm 2,4-D for 2 yr showed no adverse effects on survival, organ weights or pathology.

In a three-generation reproduction study in rats, dose levels of 100, 500 and 1500 ppm had no effect on the fertility of males or females or a litter size, but the 1500 ppm diet reduced the survival and weight of the pups at 21 days. Assay of aliesterase and acylamidase activity in liver homogenates, microsomes and mitochondria form 90-day-old second-generation rats fed 0, 100 or 500 ppm 2,4-D revealed no differences between test and control rats.

In an assessment of the safety of 2,4-D residues in food, it is calculated that the maximum possible intake based on US legal tolerance would be 0.3 ppm of the total diet. Thus a wide margin of safety exists between this level and the levels employed in the above 2-yr rats and dogs studies.

## SUMMARY AND CONCLUSIONS

Waterchestnut (Trapa natans) is an annual plant, thereby relying on the production of the seeds for existence. Each germinated seed is capable of producing 10 to 15 rosettes of leaves crowded together on the end of the stem which float on the surface much the same as Waterlily leaves. In some cases, these become so dense that they stand upright out of the water. Each rosette produces 15 to 20 seeds, which when mature are about the size of a hickory nut and have 4 sharp recurved spines. These are slightly buoyant and are transported by tides and currents. They remain viable for several years. The germinating seed sends out a stolon which gives rise to several tough stems, each of which may branch several times and be as long as 15 feet. Thus the rosettes from a single plant may form a surface cover of up to 10 feet in diameter. /

### Current

In a review of this research, the Scientific Advisory Panel (FIFRA) did not recommend further research studies to determine the "No Effect Level" and it is presumed that 2,4-D as used in the Aquatic Plant Control Program, State of New York, does not create environmental or health hazards.

REFERENCES

1. Averitt, W. K. and Gangstad E. O. Dissipation of 2,4-D in static water. *J. Environ. Qual.* 5:145-147. 1976.
2. Bartley, T. R. and Gangstad E. O. Environmental aspects of aquatic plant control. *Journ. of the Irrigation and Drainage Division ASCE.* Sept 1974 pp 231-244. 1974.
3. Gangstad, E. O. Herbicidal control of aquatic plants. *J. of the Sanitary Engineering Division, ASCE.* April 1972 pp 397-406. 1972.
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6. Schultz, D. P. and Gangstad E. O. Dissipation of residues of 2,4-D in water, hydrosoil and fish. *J. Aquatic Plant Manage.* 1 4:43-45. 1976.
7. Sikka, H. C., Appleton H. T. and Gangstad E. O. Uptake and metabolism of dimethylamine salt of 2,4-dichlorophenoxyacetic acid by fish. *J. Agric. Food Chem.* 25:1030-1033. 1977
8. Smith, Ralph H. Experimental control of water chestnut (Trapa natans) in New York State, *New York Fish and Game Journal* 2:173-193. 1955
9. Steenis J. H. and Steets, V. D. Recent tests on waterchestnut control. *Proceedings, 20th Northeastern Weed Control Conference.* 20: 966. 1966

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